



Status of ENDF/B-VII.1 Library

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ENDF/B-VII.0 → ENDF/B-VII.1



Released December 2006
(16 years after ENDF/B-VI)



CSEWG 2006

Major contributors

- LANL (actinides, light nuclei, thermal neutron scattering)
- BNL (fission products resonances & fast, decay data)
- ORNL (resonances)



294 citations
(SCOPUS)

Release December 2011
5 years after ENDF/B-VII.0

Major improvements:

- structural materials
- minor actinides
- covariances (110 materials for AFCI)
- eliminating some deficiencies
- fixing errors

Roadmap:

- beta0 version November 2010
- beta1 version January 2011
- **beta2 version February 23, 2011**
- beta3 version May 2011
- release & paper December 2011

Major Changes Planned for ENDF/B-VII.1

1. Covariances (VII.0: 4% => VII.1: 30%) (BNL, ORNL, LANL)
2. Light nuclei based on R matrix work at LANL (4He, 6Li, 9Be, **16O**)
3. Structural materials:
 - 3.1. New evaluations – supported by **criticality safety** (ORNL)
 - 3.2. Improvements to thermal cross sections (BNL)
4. Pu fission products yields, delayed neutrons, gamma data (LANL, LLNL)
5. Actinides – a few new evaluations for minor actinides, improvements to fission, capture, (n2n) using feedback from **critical assembly reaction rate data**, and data from LANSCE, CERN etc (LANL)
6. Many new JENDL-4 data adopted for Minor Actinides

ENDF/B-VII.1beta2 (neutron sublibrary)

Total number of materials	418
New or revised materials	168
Totally or partially new materials	62
- LANL	10
- LANL/ORNL	8
- ORNL	10
- ORNL/IAEA	6
- BNL	3
- LLNL	8
- IRMM (Geel, Belgium)	7
Thermal x-sec adjustment BNL	10
Other fixes	21
Adopted:	75
- JENDL-3.3 (R.Q. Wright corr.)	2
- JENDL-4.0	69
- JEFF-3.3 (R.Q. Wright corr.)	4

New or partially new evaluations in beta2

- **He-4** New R-matrix analysis by LANL
- **Li-6** New R-matrix evaluation by LANL using WNR data
- **Be-9** New evaluation by LANL
- **O-16** New R-matrix evaluation by LANL including covariances
- **F-19** New MF2/32 evaluation by ORNL
- **Na-23** New full range evaluation by BNL
- **Cl-35** New R-Matrix Limited MF2/32 evaluation by ORNL
- **Cl-37** New MF2/32 evaluation by ORNL
- **K-39** New MF2/32 evaluation by ORNL
- **K-41** New MF2/32 evaluation by ORNL
- **Ti-46** New fast neutron region and covar. by LANL, new MF32 by ORNL
- **Ti-47** New fast neutron region and covar. by LANL, new MF32 by ORNL
- **Ti-48** New fast neutron region and covar. by LANL, new MF32 by ORNL
- **Ti-49** New fast neutron region and covar. by LANL, new MF32 by ORNL
- **Ti-50** New fast neutron region and covar. by LANL, new MF32 by ORNL

New or partially new evaluations in beta2

- **V-51** New fast neutron region and covariances by LANL, MF2 from JENDL-4
- **Cr-50** New MF2/32 by ORNL
- **Cr-52** New MF2/32 by ORNL
- **Cr-53** New MF2/32 by ORNL
- **Cr-54** New MF2/32 by ORNL
- **Mn-55** New MF2/32 by ORNL, new fast neutron region and covar. by IAEA
- **Ni-58** New MF2/32 by ORNL, updated a-production, various corrections
- **Ni-62** New MF2 evaluation by BNL
- **Kr-78** New fast neutron region by LLNL merged with MF2 from ENDF/B-VII.0
- **Y-89** New evaluation for total and capture by LANL
- **Zr-90** New MF2 by BNL, bound level at -234 keV removed
- **Cd-106,108,110,111,112,114,116** New MF2 from IRMM
- **Xe-123, 124** New fast neutron region by LLNL, various fixes by BNL
- **Ta-180, 181** New fast neutron region by LLNL, various fixes by BNL

New or partially new evaluations in beta2

- **W-180, 182, 183, 184, 186** New MF2/32 by ORNL, new fast neutron region + covariances by IAEA
- **Re-185, 187** New fast neutron region by LLNL with BNL fixes
- **U-235** LANL reverted dn 6-grp to ENDF/B-VI.8, new MF33 evaluation by ORNL/LANL, PFNS (MF5,MT18) on finer grid
- **U-237** New LANL (Phil Young) fast neutron region and dn 6-grp reverted to ENDF/B-VI.8
- **U-238** LANL reverted dn 6-grp to ENDF/B-VI.8, new MF33 evaluation by ORNL/LANL
- **U-239** New fast neutron region by LLNL with MF2 estimated by A. Trkov BNL
- **Pu-238** New fast neutron region by LANL (P.G.Young et al.)
- **Pu-239** New MF35,MF31,PFNS by LANL, new MF33 by ORNL/LANL, LANL reverted dn 6-grp to /B-VI.8, BNL extended URR to 30keV,
- **Pu-240** New fast neutron region by LANL including MF31,33,35
- **Am-241** New evaluation and covariance matrices by T. Kawano LANL

Thermal and resonance region updates

S. Mughabghab (BNL)

Work motivated by integral reactivity worth measurements by Dean et al. indicating deficiencies in VII.0.

Reevaluation of the thermal values by adjusting parameters of bound and initial unbound resonances for:

- Mn-95
- Tc-99
- Rh-103
- Ag-109
- Cd-113
- Nd-145
- Eu-153
- Cs-133
- Nd-145
- Eu-153

Gd-157

Modification of thermal cross section

- Following new RPI measurement reporting thermal capture ~10% lower than ENDF/B-VII.0
- Supported by integral experiments
- Gamma width of the first resonance decreased by 9%

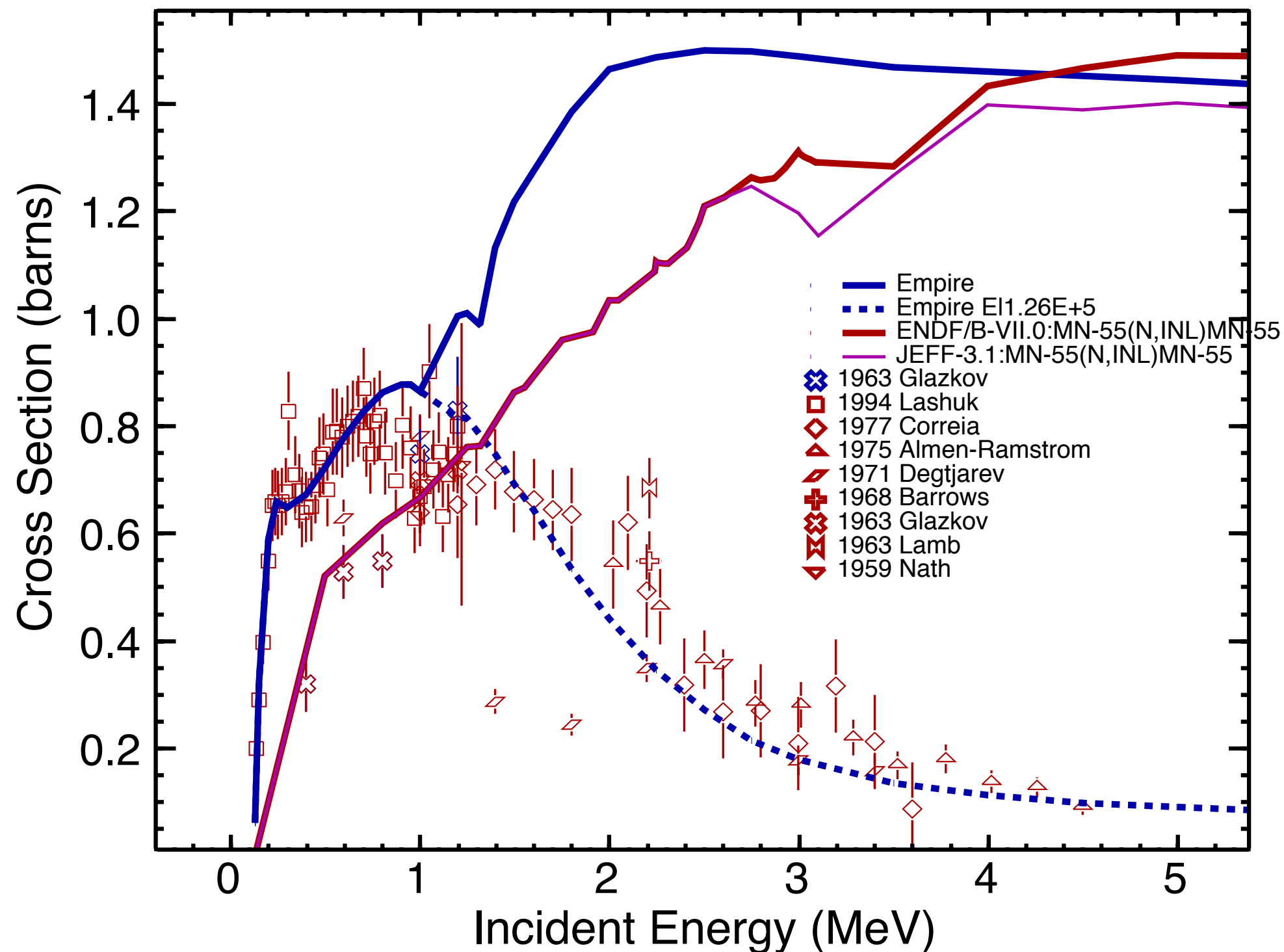
^{55}Mn - IAEA coordinated evaluation

R. Capote & A. Trkov

- RR by Luiz Leal (ORNL)
- EMPIRE code for the fast neutron region
- Newly developed dispersive optical models both for W isotopes and Mn using coupled channel formalism
- Non-coupled levels by DWBA
- Pre-equilibrium emission by exciton model
- Width fluctuation by HRTW method
- Radiative strength function - Modified Lorentzian (RIPL)
- Level densities - Enhanced Generalized Superfluid Model (RIPL-3 EGSM)
- Covariances: EMPIRE Monte Carlo + GANDR

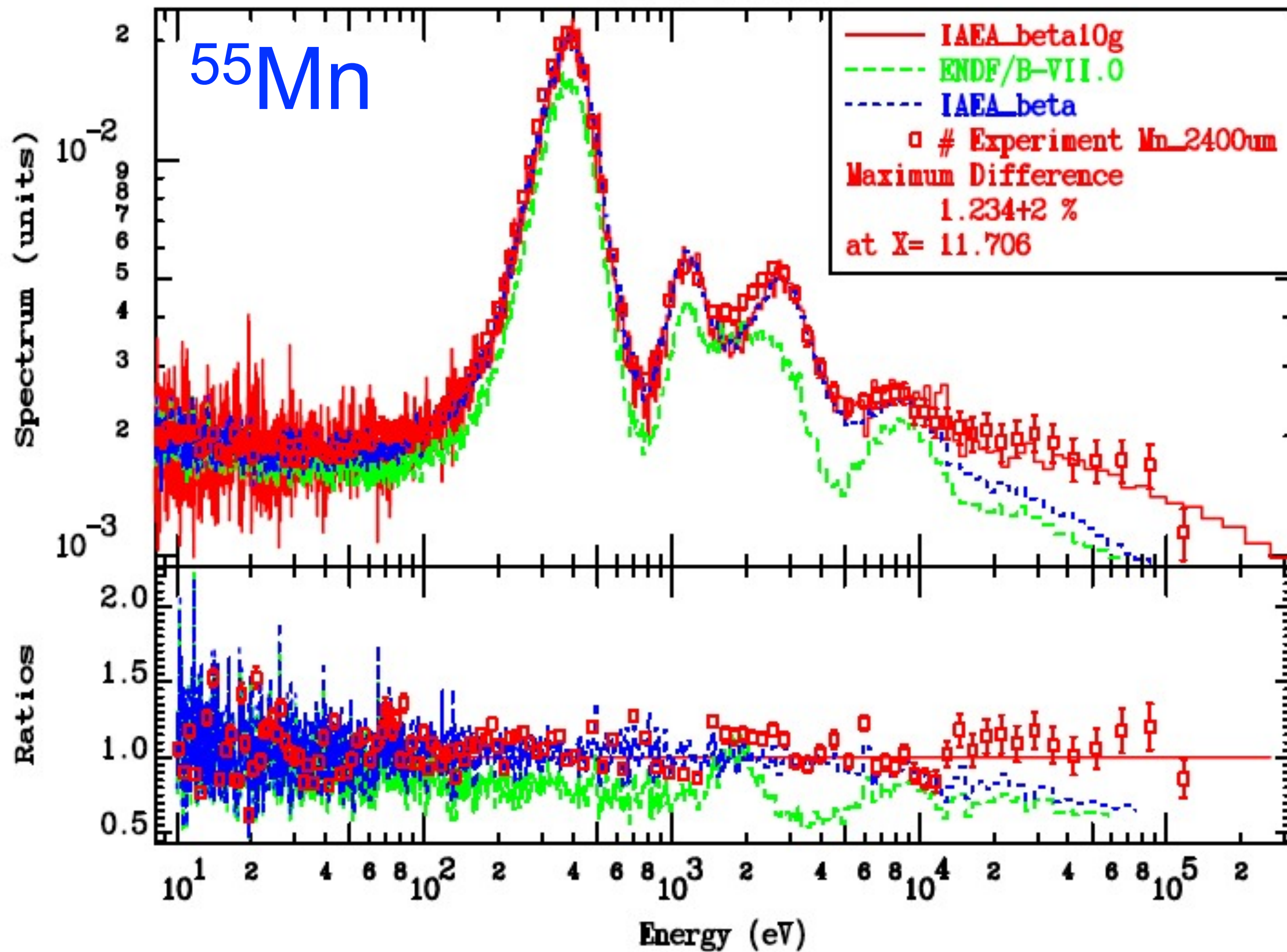
^{55}Mn inelastic scattering

R. Capote & A. Trkov



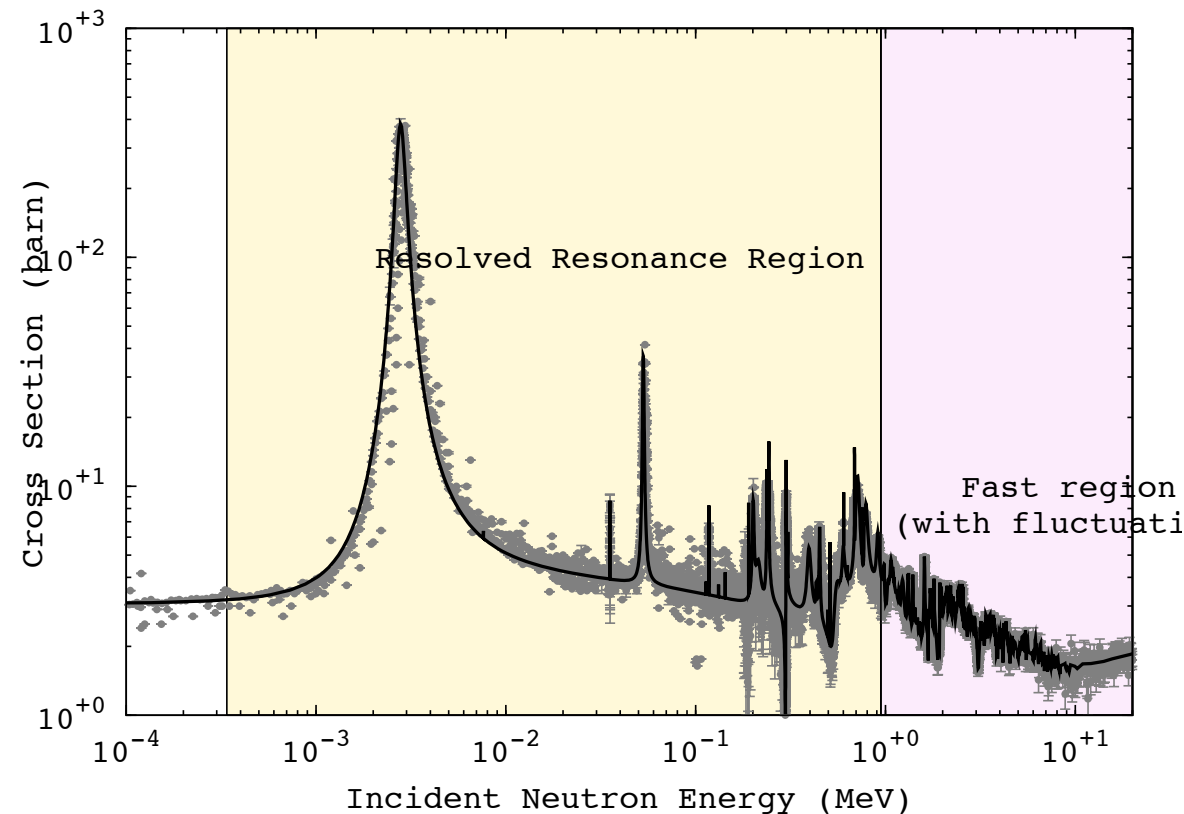
Grenoble Lead Slowing-down Spectrometer
Mn 2400 um sample

⁵⁵Mn

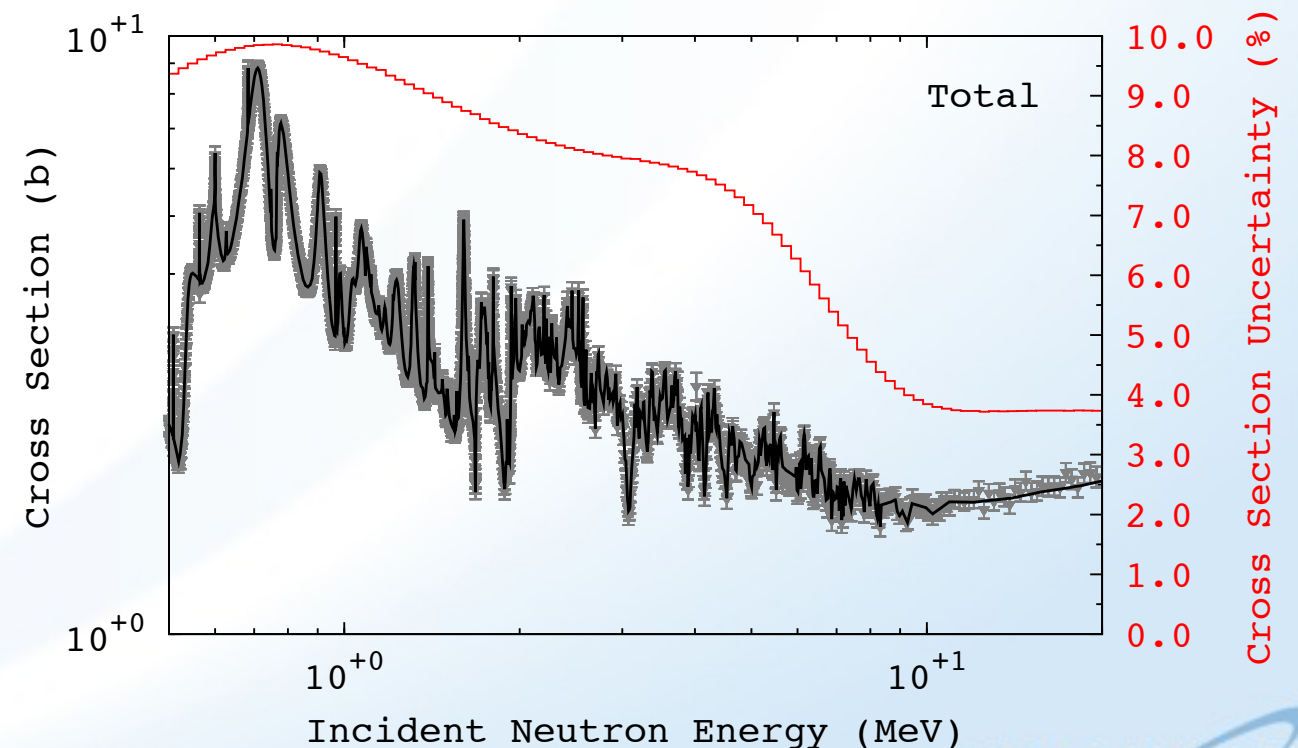
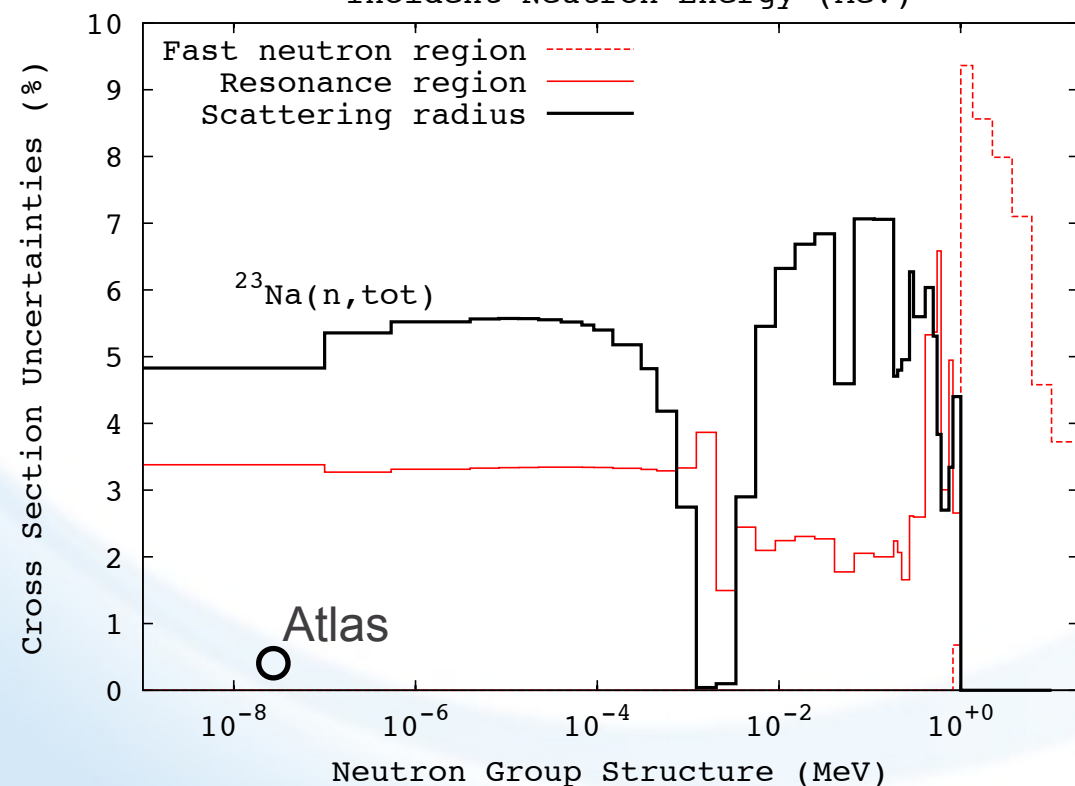


^{23}Na evaluation - BNL/INL assimilation project

from integral experiment to reaction model parameters

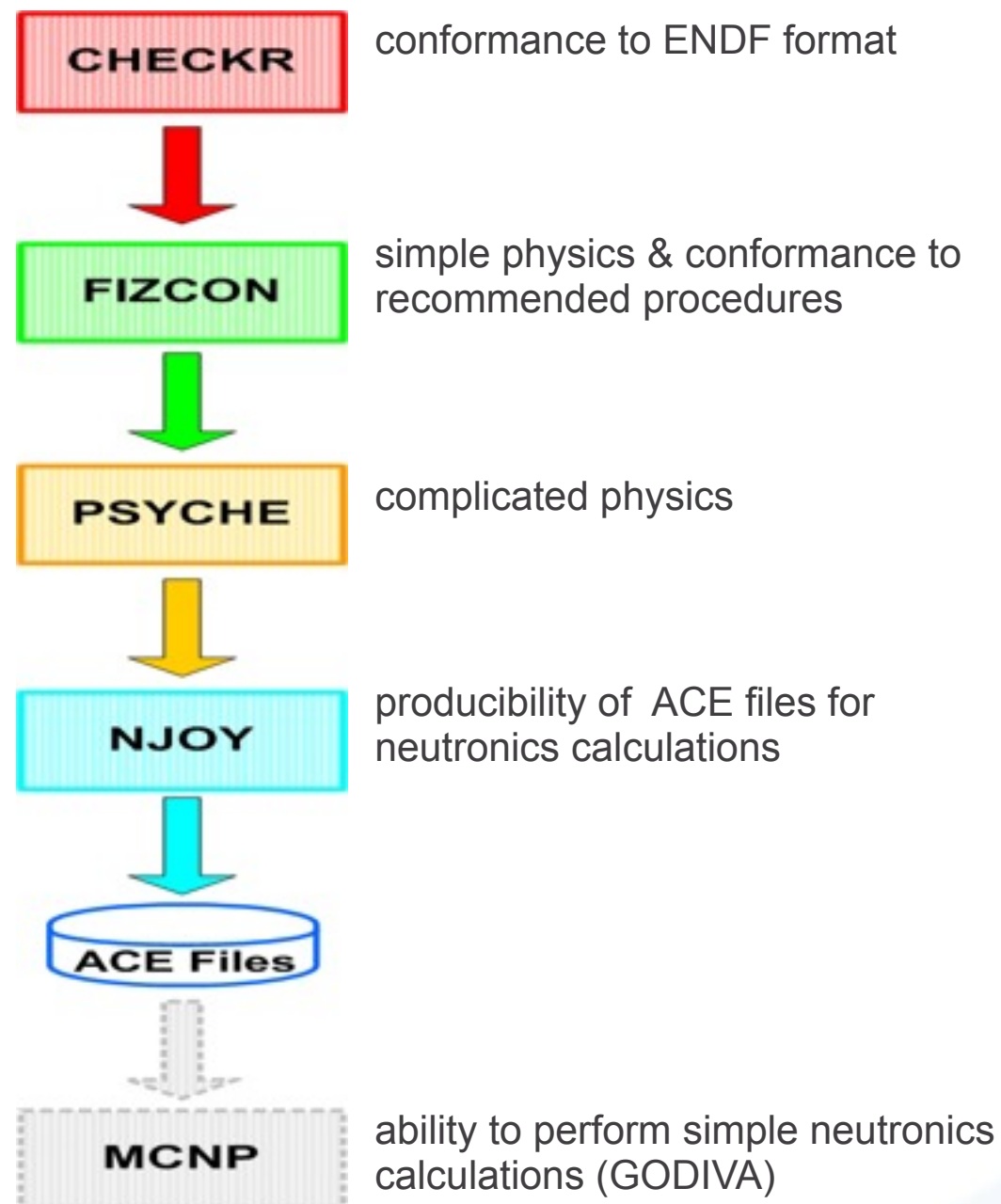


- EMPIRE/KALMAN used in the fast range
- Fluctuations in above 1 MeV reproduced with 'Tune' parameter in EMPIRE
- ~120 resonance and reaction model parameters varied - only 10 important
- Scattering radius included (no correlations)



ENDF/B-VII.1 beta2 verification at BNL

R. Arcilla



NNDC Linux Cluster



CHECKR, FIZCON, PSYCHE can be downloaded from <http://www.nndc.bnl.gov/nndcscr/endl/endl-util/index.html>

ENDF/B-VII.1 beta2 verification at BNL

- Updates of checking codes were needed to process all new evaluations
- Number of formal errors in evaluations corrected
- In a few cases authors asked to revise the files
- Checking VIEWR plots critical
- F-19 and CI-35 (R-Matrix Limited format) need NJOY-2009 or -2010
- Verification chain run several times over the whole library
- Help from LLNL - conversion of beta2 into XENDL format and back revealed hidden errors in VII.0 (MF14)
- Checking physics consistency (case of Cr isotopes)

Evaluation of Cr isotopes

- New resolved resonance parameters determined with SAMMY analysis for all Cr isotopes at ORNL
- Initial file contained new Karlsruhe evaluation in fast neutron region
- BNL checking revealed number of problems in the fast neutron part
 - energy balance
 - gamma production
 - elastic angular distributions at low energies
- ORNL RR merged with ENDF/B-VII.0 fast neutron region at BNL

Covariances in ENDF/B-VII.1

AFCI effort by BNL and LANL

List of nuclei in AFCI (priority materials in **bold**)

¹ H	²⁸ Si	⁹² Mo	¹⁰⁹ Ag	¹⁴⁹ Sm	²³² Th
² H	²⁹ Si	⁹⁴ Mo	¹²⁷ I	¹⁵¹ Sm	²³³ U
⁴ He	³⁰ Si	⁹⁵ Mo	¹²⁹ I	¹⁵² Sm	²³⁴ U
⁶ Li	⁵⁰ Cr	⁹⁶ Mo	¹³¹ Xe	¹⁵³ Eu	²³⁵ U
⁷ Li	⁵² Cr	⁹⁷ Mo	¹³² Xe	¹⁵⁵ Eu	²³⁶ U
⁹ Be	⁵³ Cr	⁹⁸ Mo	¹³⁴ Xe	¹⁵⁵ Gd	²³⁸ U
¹⁰ B	⁵⁵ Mn	¹⁰⁰ Mo	¹³³ Cs	¹⁵⁶ Gd	²³⁷ Np
¹¹ B	⁵⁴ Fe	⁹⁹ Tc	¹³⁵ Cs	¹⁵⁷ Gd	²³⁸ Pu
¹² C	⁵⁶ Fe	¹⁰¹ Ru	¹³⁹ La	¹⁵⁸ Gd	²³⁹ Pu
¹⁵ N	⁵⁷ Fe	¹⁰² Ru	¹⁴¹ Ce	¹⁶⁰ Gd	²⁴⁰ Pu
¹⁶ O	⁵⁸ Ni	¹⁰³ Ru	¹⁴¹ Pr	¹⁶⁶ Er	²⁴¹ Pu
¹⁹ F	⁶⁰ Ni	¹⁰⁴ Ru	¹⁴³ Nd	¹⁶⁷ Er	²⁴² Pu
²³ Na	⁹⁰ Zr	¹⁰⁶ Ru	¹⁴⁵ Nd	¹⁶⁸ Er	²⁴¹ Am
²⁴ Mg	⁹¹ Zr	¹⁰³ Rh	¹⁴⁶ Nd	¹⁷⁰ Er	^{242m} Am
²⁵ Mg	⁹² Zr	¹⁰⁵ Pd	¹⁴⁸ Nd	²⁰⁴ Pb	²⁴³ Am
²⁶ Mg	⁹³ Zr	¹⁰⁶ Pd	¹⁴⁷ Pm	²⁰⁶ Pb	²⁴² Cm
²⁷ Al	⁹⁴ Zr	¹⁰⁷ Pd		²⁰⁷ Pb	²⁴³ Cm
	⁹⁵ Zr	¹⁰⁸ Pd		²⁰⁸ Pb	²⁴⁴ Cm
	⁹⁶ Zr			²⁰⁹ Bi	²⁴⁵ Cm
	⁹⁵ Nb				²⁴⁶ Cm

AFCI/GNEP project - 110 covariances, which will serve as a reference for constructing ENDF-6 formatted covariance files for ENDF/B-VII.1

LANL - light nuclei, actinides, fission spectra.

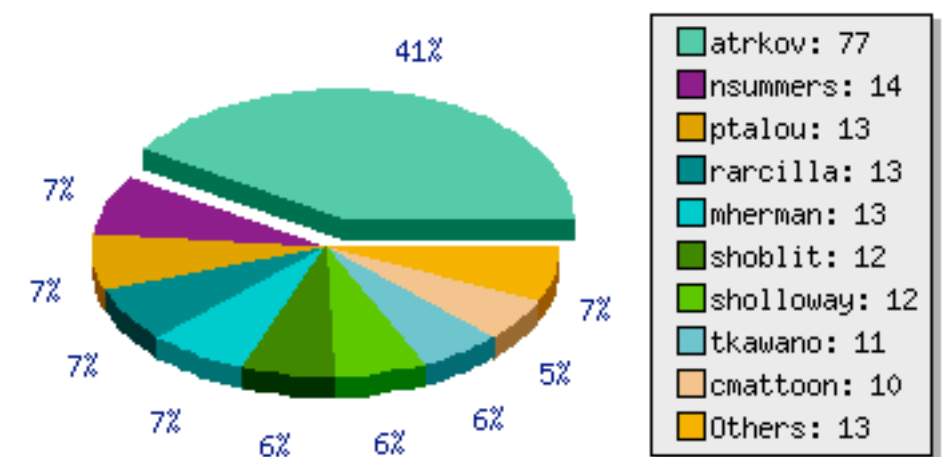
BNL - structural materials, Na, minor actinides, and all the rest including RR.

Covariances expected in beta3 to be released in May 2011

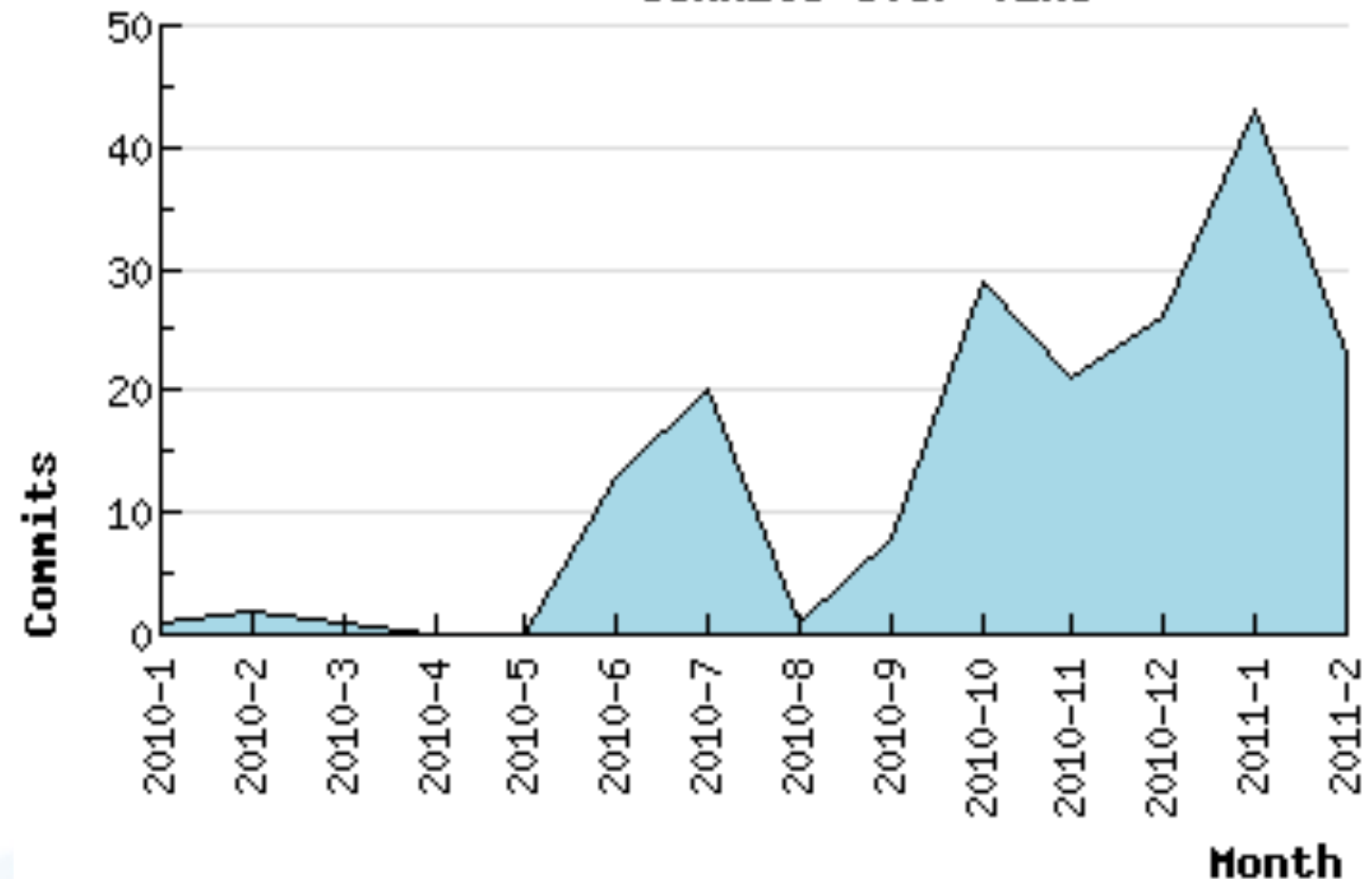
ENDF/B under GForge

- Version control: Subversion
- Deficiency tracking
- To do list tracking
- Release system
 - Tags & Files
- Documents
- Mailing list
- Wiki
- (Forum)


Commits by User






Commits Over Time



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US Library of Evaluated Nuclear Reaction Data

ENDF/B-VII.1beta.. Releases

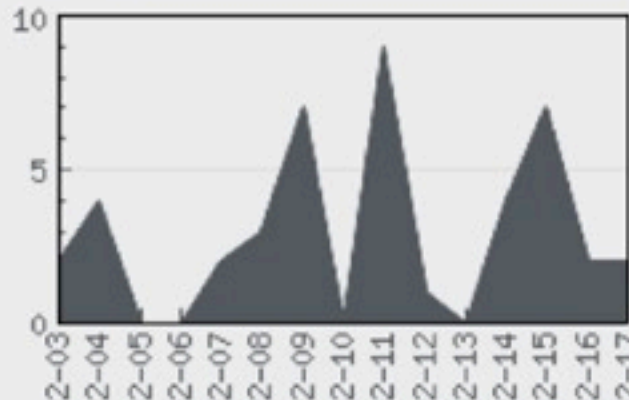
[Neutron evaluations \(ex ENDF/A\)](#) |
 [Full library](#) |
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Recent News

ENDF/B-VII Subversion Repository Blocked
Ramon Arcilla
 2011-02-17
 The Subversion (SVN) repository of ENDF/B-VII has been temporarily blocked since 2/17/2011, 5:15 p.m. in preparation for the release of ENDF/B-VII.1 Beta2. As a result, no new/revised evaluations can be committed until the repository is reopened. Thank you for your kind patience and understanding.

Time	Activity Type	By
2011-Feb-18		
18:44:26	Tracker item "Pu-239: Energy range in URR " changed status to Closed	Mike Herman
18:34:46	Tracker item "U-239: NJOY-99.360 reported NaN (not a number) thermal eta integral value in BROADR module " changed status to Closed	Mike Herman
2011-Feb-17		
16:00:23	Commit: New ORNL RRR evaluation for CI-35	Samuel Hoblit
10:27:24	Commit: Restore header line (line 1) to contain \$Revision and \$Date	Samuel Hoblit

Activity



Request to join project

Description



ENDF is the collaboration environment for the CSEWG members who are involved in the development of the Evaluated Nuclear Data File ENDF/B.

Developer Info

[Caleb Mattoon](#)
[Mike Herman](#)
[Ramon Arcilla](#)
[Michael Dunn](#)
[Marco Pigni](#)
[Skip Kahler](#)
[Toshihiko Kawano](#)
[Dorothea Wiarda](#)
[David Brown](#)
[Neil Summers](#)
[Andrej Trkov](#)
[Roberto Capote](#)
[Young-Sik Cho](#)
[Boris Pritychenko](#)
[Patrick Talou](#)

Commit activity - exact record

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Activity Type	Start Date	End Date	
Commit Tracker item a Forum post	Jan 19 2011 	Feb 18 2011 	<input type="button" value="Submit"/>

Time	Activity Type	By
2011-Feb-17		
16:00:23	Commit: New ORNL RRR evaluation for Cl-35	Samuel Hoblit
10:27:24	Commit: Restore header line (line 1) to contain \$Revision and \$Date	Samuel Hoblit
2011-Feb-15		
14:53:10	Commit: Evaluation from BNL (Pigni et al.)	Marco Pigni
2011-Feb-14		
14:18:53	Commit: and this time, the cross sections aren't set to zero above 20 MeV!	David Brown
14:11:22	Commit: put back the incident energies from 20-30 MeV in the cross section files	David Brown
13:50:43	Commit: Some of suspicious inelastic scattering levels were removed. MF6, 12, 14 were updated.	Toshihiko Kawano
13:19:13	Commit: MF6, 12, and 14 updated for fixing energy balance.	Toshihiko Kawano
2011-Feb-12		
10:45:12	Commit: Mn-55 Corrected evaluation (energy balance)	Andrej Trkov
2011-Feb-11		
18:30:59	Commit: One more file with multiple gammas listed in MF12, only one in MF14.	Caleb Mattoon
17:56:11	Commit: In MF=14 (distributions for gammas), the number of gammas should agree with the count from MF=12, but often MF=14 lists only one gamma. We are fixing this throughout the library. Breaking up into a few separate commits for simplicity: this commit is for...	Caleb Mattoon
17:34:39	Commit: In MF=14 (distributions for gammas), the number of gammas should agree with the count from MF=12, but often MF=14 lists only one gamma. We are fixing this throughout the library. Breaking up into a few separate commits for simplicity: this commit is for...	Caleb Mattoon
17:20:30	Commit: In MF=14 (distributions for gammas), the number of gammas should agree with the count from MF=12, but often MF=14 lists	Caleb Mattoon

Browsing SVN repository

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Note for the ENDF/A users


Revision 12 is the ENDF/B-VII.0 release. All new or updated files (ENDF/A) have revision numbers higher than 12. View ENDF/A conveniently by clicking on the 'Rev.' heading of the table to reorder files by the revision number.

Index of /trunk/endl7/neutrons

[Edit permissions for this directory](#)Files shown: **418**Directory revision: 248 (of 248)Sticky Revision:

File	Rev. ▲	Age	Author	Last log entry
 Parent Directory				
 n-095_Am_240.endf	<u>190</u>	5 weeks	shoblit	This was a large commit of the entire library. The change to the files was simpl...
 n-030_Zn_066.endf	<u>190</u>	5 weeks	shoblit	This was a large commit of the entire library. The change to the files was simpl...
 n-097_Bk_247.endf	<u>190</u>	5 weeks	shoblit	This was a large commit of the entire library. The change to the files was simpl...
 n-093_Np_234.endf	<u>190</u>	5 weeks	shoblit	This was a large commit of the entire library. The change to the files was simpl...
 n-023_V_050.endf	<u>190</u>	5 weeks	shoblit	This was a large commit of the entire library. The change to the files was simpl...
 n-098_Cf_246.endf	<u>190</u>	5 weeks	shoblit	This was a large commit of the entire library. The change to the files was simpl...
 n-030_Zn_067.endf	<u>190</u>	5 weeks	shoblit	This was a large commit of the entire library. The change to the files was simpl...

Checking file history



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Note for the ENDF/A users

Revision 12 is the ENDF/B-VII.0 release. All new or updated files (ENDF/A) have revision numbers higher than 12. View ENDF/A conveniently by clicking on the 'Rev.' heading of the table to reorder files by the revision number.

Log of /trunk/endl7/neutrons/n-022_Ti_050.endf

Parent Directory

Links to HEAD: (view) (download) (annotate)

Sticky Revision: Set

Revision 247 - (view) (download) (annotate) - [select for diffs]
Modified Thu Feb 17 15:27:24 2011 UTC (32 hours, 39 minutes ago) by shoblit
File length: 802143 byte(s)
Diff to previous 242
Restore header line (line 1) to contain \$Revision and \$Date


Revision 242 - (view) (download) (annotate) - [select for diffs]
Modified Mon Feb 14 18:19:13 2011 UTC (4 days, 5 hours ago) by tkawano
File length: 802143 byte(s)
Diff to previous 237
MF6, 12, and 14 updated for fixing energy balance.

Revision 237 - (view) (download) (annotate) - [select for diffs]
Modified Fri Feb 11 22:20:29 2011 UTC (7 days, 1 hour ago) by cmattoon
File length: 786348 byte(s)
Diff to previous 193
In MF=14 (distributions for gammas), the number of gammas should agree with the count from MF=12, but often MF=14 lists only one gamma. We are fixing this throughout the library. Breaking up into a few separate commits for simplicity: this commit is for Z<=40

Revision 193 - (view) (download) (annotate) - [select for diffs]
Modified Wed Jan 12 00:37:18 2011 UTC (5 weeks, 2 days ago) by mherman
File length: 786348 byte(s)
Diff to previous 100

Tuesday, February 22, 2011

Managing releases



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Release Name	Release Date	Filename	File Size	Download Count
beta1	2011-01-11 00:00:00-05	beta1-versus-beta0.txt	9 KB	12
		beta1-versus-VII 0.txt	13 KB	13
		ENDF-B-VII.1beta1.tgz	227 MB	31
		ENDF-B-VII.1beta1-checkr-errors	7 KB	7
		ENDF-B-VII.1beta1-fizcon-errors	66 KB	4
beta0	2010-10-22 00:00:00-04	ENDF-B-VII.1beta0-new-rev-list.txt	6 KB	32
		ENDF-B-VII.1beta0-checkr-errors	19 KB	9
		ENDF-B-VII.1beta0-fizcon-errors	37 KB	5
		ENDF-B-VII.1beta0.tgz	204 MB	369

Manage Package




FORGE

Advanced Server

Tuesday, February 22, 2011

Wiki - collaborative documents



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 [#158] Beta2 vs VII.0

List of evaluations in ENDF/B-VII.1beta2 which differ non-trivially from VII.0

ENDF/B-VII.0 = rev 12
B-VII.1 beta0 = rev 130
B-VII.1 beta1 = rev 192
B-VII.1 beta2 = rev 248

	Material	Rev.	Commit comments
1.	n-001_H_001.endf	27	Bob Little's fixe for ACE library
2.	n-001_H_003.endf	80	H-3(n,2n) cross section from /B-VI.8 library was inserted
3.	n-002_He_004.endf	104	New R-matrix analysis by G.M.Hale (Sep. 2010)
4.	n-003_Li_006.endf	181	New R-matrix evaluation by G.M.Hale using WNR data, corrected in betal
5.	n-004_Be_009.endf	29	New evaluation by LANL
6.	n-007_N_014.endf	81	The upper energy was fixed before, total cross section fixed
7.	n-008_O_016.endf	109	New R-matrix evaluation, including covariance matrices
8.	n-009_F_019.endf	183	New MF2/32 evaluation by ORNL, small errors corrected
9.	n-011_Na_022.endf	31	Modifications to resonance total width
10.	n-011_Na_023.endf	246	New evaluation from BNL (Pigni)
11.	n-015_P_031.endf	90	P-31 capture adjusted, redundant x.s. made consistent.
12.	n-016_S_034.endf	79	Fix of zero background in MF3/MT1, Lin interpolation to 4th point, fix NDIGIT and ISR in MF32
13.	n-017_Cl_035.endf	248	New ORNL resonance param. evaluation, Reich-Moore Limited (LRF=7, LCOMP=2)
14.	n-017_Cl_037.endf	32	New MF2/32 by ORNL
15.	n-019_K_039.endf	33	New MF2/32 evaluation by ORNL
16.	n-019_K_041.endf	33	New MF2/32 evaluation by ORNL
17.	n-021_Sc_045.endf	27	Bob Little's fixe for ACE library
18.	n-022_Ti_046.endf	242	New evaluation by LANL, ORNL resonance covariances merged, energy spectra updated, MF6,12,14 updated for E balance
19.	n-022_Ti_047.endf	242	New MF32 evaluation by LANL/ORNL, resonance covariances merged, energy spectra updated, MF6,12,14 updated for E balance
20.	n-022_Ti_048.endf	242	Resonance covariance merged, energy spectra updated, MF6,12,14 updated for E balance

Tuesday, February 22, 2011

Next steps towards ENDF/B-VII.1

- micro-CSEWG meeting - end of March at BNL
 - Validation results for beta2
 - Covariances
 - Further actions
- ENDF/B-VII.1beta3 in May before mini-CSEWG meeting in June
 - Full set of AFCI-2.0 covariances
 - Fix eventual problems
 - Address validation issues
- mini-CSEWG meeting - June 2011 on Long Island
- July 2011 - papers ready for review
- Final beta4 version in October 2011
- CSEWG meeting - November at BNL
 - Approval of the library
- Release in December 2011
- Nuclear Data Sheets publications in December 2011